



Project Summary

Texas Department of Transportation

0-5496: Tracking the Performance of HMA Mixtures in Texas

Background

The TxDOT Pavement Management Information System (PMIS) database includes performance information for all roads constructed and maintained by TxDOT. A large percentage of these roads are paved with hot-mix asphalt (HMA) as part of construction or rehabilitation projects, which in turn are recorded in the TxDOT Design and Construction Information System (DCIS) database. Therefore if one is able to locate where on the road the HMA is paved (using DCIS) then the performance information from PMIS could be used as an indicator of the performance of the HMA surfacing on the road. The study was later expanded to include the TxDOT SiteManager database that contains project design and construction quality control and assurance (QC/QA) information. In addition to linking multiple databases, a program was needed to show the physical location for all of these materials around the state in a Graphical Information System (GIS) environment. With all of these links in place the primary objective could then be achieved, to develop a program that can show how HMA materials actually perform based on empirical data from TxDOT's extensive databases.

What the Researchers Did

A link was established between the DCIS, SiteManager, and PMIS databases. This involved determining the beginning and ending extents of a project in terms of geographical coordinates (longitude & latitude) and Texas Reference Marker (TRM) locations. A web-based GIS application was developed that is available online at the following address: <http://pavements.ce.utexas.edu/TxDB/TxDB.html>. This application provides a front-end with functions to:

- input new SiteManager projects into the system,
- filter, query, and edit existing projects,
- report general, performance, design, and construction information for SiteManager projects, and
- statistically evaluate the influence of various factors including HMA mixture type on pavement performance.

A mapping function is provided to identify the longitude and latitude coordinates of project beginning and ending extents. A total of 500 HMA SiteManager projects throughout Texas were input into the system.

Research Performed by:

Center for Transportation Research (CTR),
The University of Texas at Austin

Research Supervisor:
Jorge Prozzi, CTR

Researchers:
Andre Smit, CTR

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What They Found

The web-based application is capable of performing a series of statistical analyses that are used to investigate the relative roughness, rutting, and cracking performance of various HMA mixtures, under varying conditions with respect to climate, traffic, pavement facility (structure), and amount of maintenance applied.

While, in general, the analysis results do positively indicate trends that are expected, others are unrealistic - the roughness measurements provided more realistic results compared to the cracking and rutting measurements. The incorporation of SiteManager allowed a better identification of project location and extents, which addressed the shortcomings of using DCIS. As expected, this resulted in reduced errors associated with the analyses presented. Thus, while the reported analyses highlighted the potential benefits of a network-level analysis to track the performance of HMA in Texas it also indicated some limitations with respect to the use of PMIS data, notably the insensitivity of the performance variables to PMIS rutting severity groupings and the subjective nature of PMIS visual assessments of cracking.

What This Means

The statistical analysis procedure in the application can currently be used to investigate and compare the relative performance of HMA mixtures with respect to a number of influence factors such as climate, traffic, facility type, and HMA material properties. There is potential to improve the analysis procedure by incorporating additional influence factors and including cost-benefit calculations by incorporating pricing information. The application provides a framework to track the performance of HMA in Texas. The link currently established between DCIS, SiteManager, and PMIS can be extended to link and include other TxDOT databases, e.g., the Texas Flexible Pavements database and the Maintenance Management Information System (MMIS) database. Also, the application could be expanded and used to track the performance of other materials in Texas, not just HMA. Furthermore the geographical component of the application opens up numerous possibilities that may be explored to optimize TxDOT construction operations.

For More Information:

0-5496-1 Developing a Sustainable Flexible Pavement Database in Texas

Research Engineer - German Claros, TxDOT, 512-465-7403

Project Director - Brett Haggerty, TxDOT, 512-506-5841

Research Supervisor - Jorge Prozzi, CTR, 512-232-3488

www.txdot.gov

keyword: research



Research and Technology
Implementation Office
P.O. Box 5080
Austin, Texas 78763-5080
512-465-7403

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